SIEMENS
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Marine

Cox Marine

British startup Cox Marine ready to revolutionize the outboard engine industry thanks to digitalization

Products

Teamcenter, NX, Simcenter

Business challenges

Develop a dedicated outboard engine and matching business model to succeed in the global marine industry as a small British startup

Design and engineer a marine diesel outboard engine that is more fuel-efficient yet high-powered, more durable, and cleaner

Integrate the right digitalization tools to succeed in product development and to support a growing international business model

Keys to success

Implemented an end-to-end digitalized design and development process

Developed a highly accurate digital twin of the CXO300 engine

Solid commitment from a small, passionate and experienced team of engineers

Implementation support from Siemens Solution Partner OnePLM

Xcelerator portfolio helps cut costs and development time

Changing the game for outboard engines

The massive, market-changing advantages of a high-powered, fuel-efficient, cleaner V8 diesel outboard engine are obvious to salmon farmers in the Norwegian fjords or islanders in the Maldives who drive Zodiac boats to work. For Joel Reid, these advantages are front of mind.

Reid is the global sales director of Cox Marine, a British startup based in Shoreham-by-Sea, near Brighton, UK. A company with a serious desire to change things for the better, Cox Marine knows a business opportunity when it sees one – and knows how to act fast. This was the case with its first product, the CXO300 outboard engine, which is packed with punch yet 25 percent more fuel efficient and cleaner than most other outboards in the global marine industry.

Specifically designed for the marine industry, the CXO300 is set to go into production in late May 2020. One of the most powerful diesel outboards on the market, this high-performance 300 horsepower engine promises to last three times longer than comparable models. And Cox Marine has more ideas up its sleeve.

"Our CEO Tim Routsis likes to say, 'We are not developing a product; we are developing a business.' And this is by far the biggest challenge that we face," explains Reid.

Clearly, Cox Marine didn't plan to just offer a dedicated marine engine. They also set up a global service network of 200 dealers and

Results

Achieved 25 percent more fuel efficient and cleaner outboard engine

Developed an engine that is expected to last three times longer than comparable models

Managed a design process with 6,500 part numbers in the total outboard

Saved hundreds of thousands of pounds in costs and months of development time

representation in 100 countries. And while they reinvented the marine outboard engine, why not reinvent the service model as well? The company aims to redefine the standards of global service and customer care including cloud-based data analytics services, such as engine performance statistics, revenue savings, real-time maintenance information and other predictive diagnostics.

"We were able to build a much bigger and comprehensive organization to deal with the mammoth task of not just developing a diesel outboard as a product, but also developing an organization that can manage global demand, global services and volume manufacturing," adds Reid.

The choice for diesel

In this day and age, the conscious choice for diesel might seem strange to some. But high-performance diesel offers numerous advantages to the marine community. One, it eliminates the burdensome and sometimes messy practice of self-mixing the right gas/oil ratio, a requirement for classic two-stroke outboard engines. Secondly, diesel is cheaper, more readily available and far less combustible than gasoline. And, diesel offers better fuel performance, which means significant bottom-line savings for price-sensitive operators with high hour usage ratios. (Think of the aquaculture farmers in Norway or an offshore rig that transports staff back and forth daily.)

"With our engine, you get the fuel savings of an inboard diesel engine combined with the lower risk of an outboard engine," Reid says. "Downtime is a very important aspect for many customers. If they can't operate, they can't make money. Diesel engines are dependable workhorses. And, if worse

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comes to worse, you can swap an outboard engine or transmission. It is much easier to repair than an inboard. This is why our diesel outboard concept is so appealing to broad segments of the market. I can't see anybody who wants to go fast with a 300-horsepower requirement that wouldn't want our product."

Designing it right

The bigger commercial picture aside, creating a bespoke, horizontal V8 engine for the marine market requires a high level of excellence when it comes to engineering. Excellence is in the heart and soul of Cox Marine. It all started in 2007 when motorsports racing engineer David Cox came up with the idea to develop a lightweight diesel outboard using Formula One® (F1) technology. Charles Good joined as chairman and this idea was extended to the diesel outboard market the next year. When the first concept engine was fired up in 2010, Cox Marine was still a very small team of four or five people. Over the next years, the team worked on the alpha and beta engine versions in partnership with Ricardo. In 2014 the current CEO, Tim Routsis, a former Cosworth executive and a serious racing insider, joined the company and started to push Cox Marine into the market as a global player.

Over the next five years, engineers and experts from all types of fields from marine and automotive to motorsports and aviation joined the team. Everyone shared a single credo: a passion for fast engines and the belief that Cox Marine could change the marine industry for the better.

Translating this passion and vision into a high-performance reality posed many technical challenges, and getting it right was mission-critical.

"We had to make something as small and light as a car engine, but as strong and robust as a big truck engine. Software plays a huge role in understanding how to optimize and design structures. There are so many elements to consider," explains Reid. "Digitalization for Cox Marine is the opportunity to stand out in the crowd."

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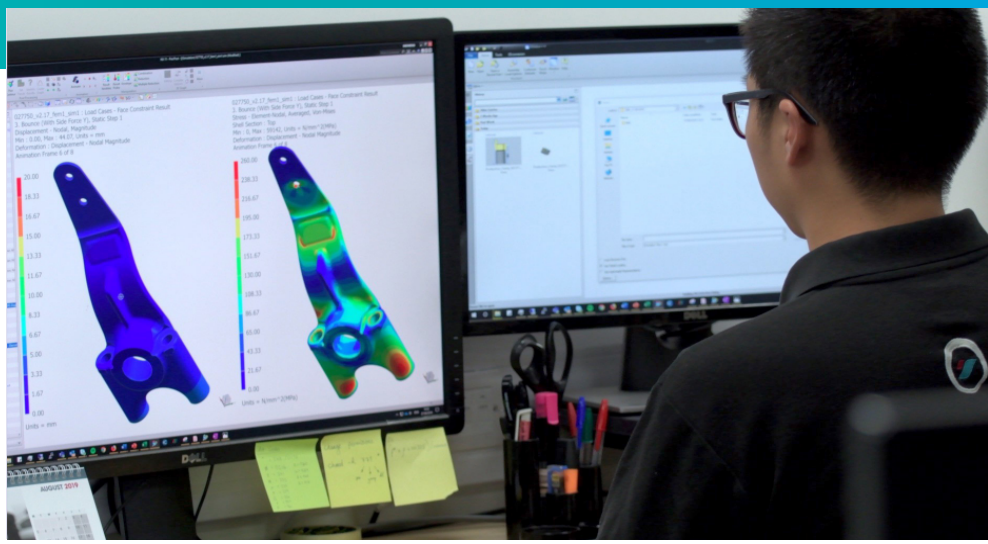

Enter the game-changer: digitalization

And digitalization is where tools from Siemens Digital Industries Software enter the picture. Specifically, the team relies on digitalization tools from the Xcelerator portfolio, including Teamcenter® software for end-to-end integration, NX™ software for seamless design capabilities and Simcenter™ software for comprehensive digital twin and performance simulation.

"The Siemens tools are used by a large proportion of our staff. We are also using a Teamcenter integration framework to integrate the Siemens platform into our ERP solution," explains Tony Ferrier, head of IT at Cox Marine. "Teamcenter is used by most of our employees. It is at the very core of our business. It holds all our design infrastructure, so it talks to our NX systems. Teamcenter manages all our documentation – all our bills of materials. This information drives the process all the way from design and engineering to our manufacturing process and production facility."

Enter the channel partner: OnePLM

Getting the whole process up and running didn't happen overnight. Cox Marine counted on Siemens Solution Partner OnePLM, a recognized Smart Expert partner, to help implement the right tools at the right time and to bridge the digital backbone and ecosystem into the company's ERP and production solutions properly.

"Our IT systems seem quite complex for a small startup, but as the company grows, it is very scalable," Ferrier says. "We won't need to make any major adjustments in our infrastructure. Looking forward, we can go from making tens of engines per week to making thousands of engines per week if required."

The experts from OnePLM are onsite regularly, making sure that the Teamcenter, NX and Simcenter installations are up to speed and adapted to the growing infrastructure of Cox Marine.

Stability and seamless integration: Teamcenter and NX for the Cox design team

Cox Marine is on the fast track when it comes to growth – the software implementation and the design process run in parallel. Luckily, the design team, led by Julian West, principal engineer, is full of experts from F1 racing, motorsports and aerospace. Like everyone at Cox Marine, they are passionate about designing and engineering things that go fast. The tools that support this team need to be one step ahead of the game as well. Most of the team have solid NX experience, but, especially on the design side of things, implementing the complete Teamcenter and NX backbone changed the way the team worked.

"We have a large product with 6,500 part numbers in the total outboard," says West. "For guys working on big sections all day, just letting the tool do its thing, working all day without constantly crashing or freezing with big assemblies open really is one of the most powerful aspects for us."

Another aspect that the design team appreciates is the seamless integration between Teamcenter and NX. "The best way to explain is that it is practically invisible," says West. "The guys in the team fire up their terminals, fire up Teamcenter and fire up NX, open the data they need and get on with it." West was quick to credit the Siemens tools with keeping its bill of materials complete and accurate. "For the first time in our business history, we have total control over the total content of our bill of materials,"

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Euan Freeman
Principal Engineer, Systems Engineering and Fluid Analysis
Cox Marine

Solutions/Services

Teamcenter
siemens.com/teamcenter

Simcenter
siemens.com/simcenter

NX
siemens.com/nx

Customer's primary business

Cox Powertrain is a world-leading, innovative British engineering company that develops marine diesel outboard engines for worldwide and multi-market applications. It is the first company to introduce a completely new line of high-powered, high-performance and highly durable diesel outboard engines that have been built from the ground up specifically for marine use. Cox Powertrain has a global network of distributors and dealers who have been tasked with breaking the mold to deliver sales and support service that is second to none in the marine industry. The company's mission from the start has been to create an iconic engine brand and deliver a completely new concept in diesel engines that will revolutionize the marine market.

Customer location

Shoreham-by-Sea, United Kingdom

Solution Provider Partner

OnePLM
www.oneplm.com

West says. "If you have thousands and thousands of parts and you are relying on a team of humans to build something, humans are humans, so you will make mistakes. Since turning on all those fancy tools like change control, the vast majority of errors have gone away."

Confidence in the digital twins

Like many high-end engineering environments, there is an air of friendly competition between the design and engineering teams at Cox Marine. Managed by Euan Freeman, a long-time aficionado of Simcenter™ Amesim™, the advanced engineering team has played a major role in the success of the CXO300.

The art of the possible with a digital twin

Early in the process, the engineering team at Cox Marine started to create a digital twin in Simcenter Amesim. Today, this has advanced to a co-simulation model between the Simcenter Amesim and Simcenter 3D software packages. This advanced engineering model is critical to all kinds of design decisions. With advanced performance predictions, engineers can quickly try out concepts for feasibility studies. They can model parts to see if they are the most effective. They can tweak the model virtually to see how a design change might affect performance criteria. And they can help the test team troubleshoot issues on the prototype.

"If we can use Simcenter Amesim to simulate something rather than build or 3D model it, we will," says Freeman, principal engineer for systems engineering and fluid analysis at Cox Marine. "It is a flexible tool to turn out quick answers. With Simcenter Amesim, we can potentially get the initial answers in hours or days rather than months."

The CXO300 is a massively complicated system and the core job of the engineering team is to balance issues like engine performance, fuel efficiency targets, and emissions. As a startup, getting that first engine on the market is a question of time as well as money.

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What's next?

As the designers and engineers begin work on the next product release and the test team fine-tunes final performance aspects on the water, everyone at Cox Marine is excited to see the first CXO300 outboard roll off the production lines at the new factory in Shoreham-by-Sea.

"We hope that everyone will be fully convinced that high-performance, fuel-efficient diesel outboards are the way forward," Reid concludes. "This is a journey that we all embark on. We are in this for the long run. We are in this to change the market. You do not change the market with a product. You change the market with a commitment, a service that goes for decades and decades. I think that's what makes us unique."

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